

# Observations on the breeding of Storks in India and Ceylon

BY

M. PHILIP KAHL

*Dept. of Ornithology, American Museum of Natural History,  
New York*

(With five plates)

This paper reports on some observations made on breeding storks in India and Ceylon during August-October 1966, August-December 1967, and January 1968. Observations are reported on breeding dates, behaviour, ecology, morphology, and taxonomic relationships of the six species nesting in this area.

Based on these studies I would recommend the following changes from the classification given by Peters (1931): *Ibis leucocephalus* to *Mycteria leucocephala*; *Dissoura episcopus* to *Ciconia episcopus*; *Xenorhynchus asiaticus* to *Ephippiorhynchus asiaticus*.

## INTRODUCTION

The Indian subcontinent contains six breeding species of storks (Ciconiidae). In number of breeding species it is surpassed only by Africa, which contains eight. My visits to India in August-October 1966 and August-December 1967 and to Ceylon in December 1967-January 1968 were part of a continuing study of the ecology and comparative behaviour of the storks of the world.

In India, breeding storks were studied principally in and near the Keoladeo Ghana Sanctuary at Bharatpur, Rajasthan; in the Brahmaputra flood-plain of central Assam; and at Periyar Sanctuary, Kerala. In Ceylon, I studied storks at Wilpattu National Park and, briefly, at Kalamatiya Lagoon, on the south-west coast.

In this paper I have followed the nomenclature of Peters (1931) but have suggested changes where I feel that new evidence warrants them.

## STORKS OF INDIA AND CEYLON

### *Ibis leucocephalus* Painted Stork

An abundant nester at Bharatpur, where several thousand pairs breed in years of adequate flooding. In 1966 and 1967 egg-laying began in late August after the monsoon rains and water from a nearby reservoir had flooded the nesting and feeding areas, and fish had moved into the shallow

water. Most nests were built in low 'babul' trees (*Acacia arabica*), growing in shallow water. Here Painted Storks nest in close association with a variety of other water birds (Plate I) such as *Anastomus oscitans*, *Threskiornis melanocephala*, *Platalea leucorodia*, *Egretta garzetta*, *E. intermedia*, and *Phalacrocorax niger*. The breeding colonies at the Keoladeo Ghana have been previously described by Ali (1953).

Whenever one member of a pair of Painted Storks, returns to the nest after an absence, the bird and its mate greet each other with a version of the 'Up-Down' display, shown in a variety of forms by all species of storks. Both birds point their bills upward, gape them widely open, and utter a weak, hissing scream of 1-2 seconds duration, which sounds much like the 'fizz' produced by uncapping a carbonated beverage. The head and neck are then moved downward and from side to side (Plate I); during the downward motion, the vocalization is repeated once or twice at 2-3 second intervals. Between vocalizations—during which the bill is gaped open—single, double, or triple audible snaps of the bill are given in rapid succession. However, the Painted Stork does not produce a true prolonged clattering sound during the greeting display—as do some other storks, such as *Ciconia*, *Dissoura*, *Xenorhynchus*, and *Leptoptilos*. True clattering in the Painted Stork is heard only during copulation and, occasionally, in short bursts during other courtship displays and during intra- or interspecific fights.

Behaviour patterns observed in the Painted Stork were qualitatively similar to homologous patterns shown by the Yellowbilled Stork (*Ibis ibis*) of Africa, the Milky Stork (*Ibis cinereus*) of south-east Asia, and the Wood Stork (*Mycteria americana*) of the Americas (details to be published separately). Their agreement in behaviour, coupled with morphological similarities, confirms their close relationships, and I believe that they should be united under one genus. The genus *Mycteria* has priority and, thus, the scientific name of the Painted Stork would become *Mycteria lucocephala* (Pennant).

#### **Anastomus oscitans** Asian Openbill Stork

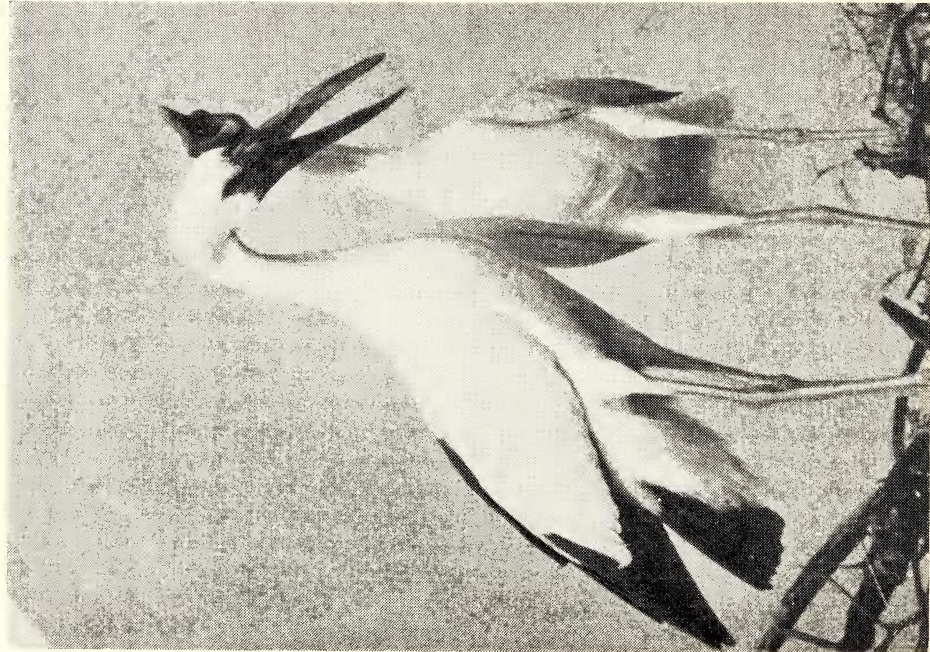
Another abundant colonial species at Bharatpur, found breeding in the same trees as the previous species but generally beginning to nest several weeks earlier. In 1966 some Openbills laid eggs in early August and many had completed clutches by the third week in August. In 1967 both the monsoon flooding and egg-laying occurred about 10 days later. Apparently Openbills begin breeding only after flooding increases the availability of their food supply by bringing the *Pila* snails out of aestivation (Saxena 1956). At Wilpattu National Park, Ceylon, Openbills were just starting to nest, but had not yet laid eggs in the nests that I saw, in late December 1967. Extralimital observations were also made in the large breeding colony at Wat Pai Lorm, near Bangkok, Thailand,

Kahl : Storks

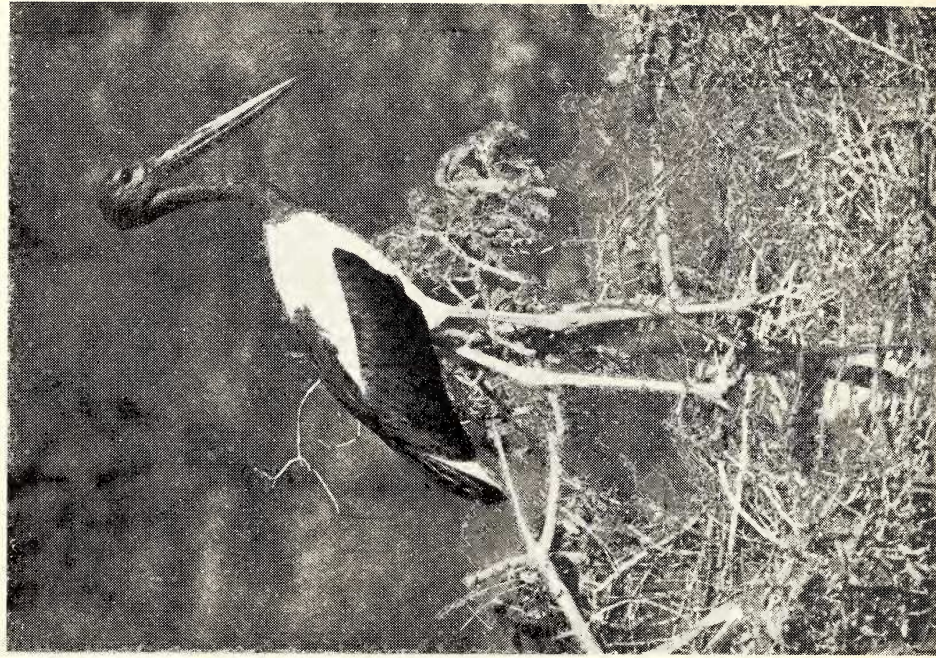


*Above* : A typical nest-tree at the Keoladeo Ghana colony, containing nests of the Painted and Openbill Storks. *Below* : The "Up-Down" greeting display, being given by a pair of Painted Storks. The male is on the right. Note erection of upper-back feathers and drooping of under-tail coverts.

*(Photos : Author)*



The "Up-Down" greeting display, being given by a pair of Openbill Storks. The male is on the left.



A pair of Blacknecked Storks at their nest at the Keoladeo Ghana Sanctuary, Bharatpur. Male standing; female incubating (note yellow eye).

where nests in all stages—from eggs to large, nearly-fledged young—were found in early February 1968.

The large fresh-water snail, *Pila globosa*, is a favourite food of Openbills. I agree with Ali & Ripley (1968 : 96) that the gap in the bill is not meant for crushing snails. The techniques used by *Anastomus* to extract molluscs from their shells—generally without extensive damage to the shell—is the subject of another paper (Kahl, in press, a). Briefly, the bird wedges the thin tip of the lower mandible under the operculum of the snail and, apparently, severs the snail's columellar muscle, freeing the body from the shell. Usually the operculum is snapped off by the tip of the bill, but in the case of small snails, the body may be swallowed with the operculum still attached.

At the beginning of the breeding season, adult Openbills are immaculate white, with black primaries, secondaries, scapulars, and tail, and with bright, deep-pink legs. Soon after the eggs are laid the white plumage turns a dirty grey, apparently through a change in the individual feathers (without a moult), and the legs fade to a duller pink.

In the nests at Bharatpur that I was able to follow closely, both parents shared the duties of incubation and feeding of the young. On several occasions a parent was seen to regurgitate a quantity (estimated at 100-200 cc.) of water and drool it over the eggs. Whether this was mainly to cool the eggs or to maintain a proper humidity is not known. Hume & Oates (1890 : 225) recorded that Openbill nests are somehow wetted by the parents but apparently did not see them regurgitate water into the nest ; they hypothesized that such moisture aided in fermentation, which in turn added warmth for incubation. Watering of the eggs has been noted in the African Openbill and several other species of storks (Kahl, unpub. notes), and in the lapwing, *Vanellus malabaricus* (Jayakar & Spurway 1965), although in the latter species the water was carried in the belly feathers rather than being regurgitated.

The 'Up-Down' greeting display of the Openbill (Plate II) is remarkably similar to that in the Painted Stork (described above). The neck is much more strongly arched forward, and the vocalizations are rather loud, oft-repeated, low-pitched and hollow honking sounds, approximately 0.5 second in duration and uttered about once per second. It is perhaps appropriate here to point out that the photograph of *Anastomus oscitans* reproduced in Thomson's (1964) NEW DICTIONARY OF BIRDS (Plate 28) and labelled 'greeting display' is actually a head-rubbing comfort movement ; it was correctly captioned when originally published in Huxley (1962). During the 'Up-Down' display the Openbill does not throw its head all the way over onto the back, as does the White Stork (*Ciconia ciconia*) nor does it clatter. During the hundreds of hours that I spent observing Openbills during two breeding seasons, I never heard true bill-clattering given during a ritualized display. During

copulation the male beats his bill rapidly back and forth against the bill of the female and produces a clattering sound ; however, here the clattering comes from the contact of the two bills, rather than from a rapid opening and closing of the bill as in the other storks.

### **Dissoura episcopus** Whitenecked or Woollynecked Stork

This stork is widespread, if uncommon, as a breeder in northern India but does not nest in colonies. During 1966 and 1967 I located three active nests within a 50 km. radius of Bharatpur and another at Sholaka, approximately halfway between Bharatpur and New Delhi. From the ages of the young in the nests, I calculated that egg-laying in this area had occurred in early or mid-July. At Periyar Sanctuary, Kerala, I found a nest in mid-December 1967 that, judging by the parents' behaviour, probably contained eggs. Dr. Sálím Ali (personal comm.) once saw a nest with large young at Periyar during the month of February.

The nests I found were of medium bulk, approximately 1 m. in diameter, and composed of sticks and small branches. They were placed in the tops of 'Neem' (*Azadirachta indica*) and 'Imli' (*Tamarindus indicus*) trees and were from 10-20 m. above the ground.

Half-grown nestlings resemble adults in pattern, except that they lack the purple iridescence on their wings and breast and have white feathers on the parts of the face that are bare plumbeous skin in the adults.

Few social displays were seen in wild birds, probably because most nests were found late in the season after the young were well grown. Furthermore, my observations on a number of species of storks suggest that in the tropics the solitary-nesting species probably mate for life, and, thus, are less demonstrative at the nest with a 'familiar' mate ; whereas colonial-nesting species probably choose a new mate each season, and, thus, tend to display more. This hypothesis is based partly on the fact that solitary species often return to the same nest in successive years, and are frequently seen in pairs even outside the breeding season.

In colonial species, there is much shifting about of females, from nest to nest, during pair-formation, and such a system would seem incompatible with a permanent pair-bond. Moreover, it is unlikely that many colonial storks reclaim the same nest in successive seasons, because few of the flimsy structures survive from one year to the next. From ringing data we know that the White Stork (*C. ciconia*) of Europe—normally a non-colonial species—often remates with the same partner for many seasons ; in this species the attraction seems to be mainly to the nest, rather than to the individual mate, *per se* (Schuz 1938 : 578).

The question of the duration of the pair-bond in the various storks will, of course, remain open until it can be demonstrated through extensive ringing operations. Such a programme would seem highly desirable—and

feasible—at the Keoladeo Ghana Sanctuary, especially among the colonial species.

I did witness an 'Up-Down' display in a pair of Whitenecked Storks in the Dehiwela Zoo, Colombo, Ceylon, in December 1967. This display and the accompanying high-pitched, whistling vocalizations were strikingly similar to the 'Up-Down' of Abdim's Stork (*Sphenorhynchus abdimii*) of Africa, and also showed affinities with the Maguari Stork (*Euxenura galeata*) of South America, and the White Stork (*C. ciconia*) and Black Stork (*C. nigra*) of Europe; details of these displays will be published elsewhere. Based on these observations, as well as other behavioural and morphological similarities, I propose that all of these genera be included in the genus *Ciconia*. Thus, the scientific name of the Whitenecked Stork would become *Ciconia episcopus* (Boddaert); such a nomenclature has already been adopted for *episcopus* by Ripley (1961) and Ali & Ripley (1968).

#### **Xenorhynchus asiaticus** Blacknecked Stork

This species was observed at length only in the vicinity of Bharatpur, where I found two nests in 1966 and seven nests (occupied by at least five different pairs) in 1967. The massive solitary nests, about 2 m. in diameter and 1-1.5 m. deep, were placed in the crowns of 'Peepul' (*Ficus religiosa*) or 'Kadum' (*Mitragyna parvifolia*) trees, usually in flooded woodlands. A nest with at least one young about two weeks old was found on 15 October 1966, indicating that egg-laying had occurred in early September. In 1967 a few nests were visited by Blacknecks in late August and early September, but egg-laying in most pairs probably was not until late September or October. The rains were more prolonged in 1967 and flooding was more extensive; perhaps these ecological conditions caused the delay in the initiation of breeding.

Several times I saw Blacknecked Storks regurgitate a large quantity (1-2 litres) of water and drool it over the contents of the nest (presumed to be eggs). On one occasion a bird drank 21 times in the marsh, flew back to the nest, and regurgitated the water over the platform. Watering the eggs has also been observed in the closely related Saddlebill Stork (*Ephippiorhynchus senegalensis*) in Africa (Kahl, unpubl. notes).

To my knowledge the Blacknecked Stork is exclusively a solitary nester. Pairs of birds were frequently seen together before nesting began, and I think it highly likely that they remain mated for life.

Most pairs watched were quite undemonstrative at the nest, seeming to pay scant attention to the comings and goings of their mate. However, I did witness and take motion-pictures of the spectacular greeting display—homologous to the 'Up-Down' in other storks—on several occasions. This display was described by Hume & Oates (1890: 266) and has apparently not been recorded since. Hume's observations were

of birds on the ground, away from the nest, but I saw it performed only by pairs in trees, usually on nest-platforms. The birds stood erect, facing each other, with their wings widely spread and the tips of one bird's wings nearly touching those of the other. They fluttered their wings rapidly (c. 3-4 times per second) and clattered loudly while holding their bills in the normal position, about 30-45° below the horizontal.

Unlike the other Indian storks, the sexes of the Blacknecked can be distinguished at a glance. The male has a dark brown iris, whereas the female has a bright lemon-yellow iris, which contrasts sharply with the black feathers of the head (Plate II). In this sexual dimorphism, as well as in numerous other aspects of morphology and in general behaviour, the Blacknecked Stork shows very close affinities with the Saddlebill Stork (*Ephippiorhynchus senegalensis*) of Africa. I believe that the two should be considered congeneric. Both genera were described on the same page of Bonaparte (1857); however, the name *Ephippiorhynchus* appeared first on the page and, thus, has priority (Mayr, Linsley & Usinger 1953 : 222) over *Xenorhynchus*. Therefore, the scientific name of the Blacknecked Stork would become *Ephippiorhynchus asiaticus* (Latham).

#### **Leptoptilos dubius** Greater Adjutant Stork

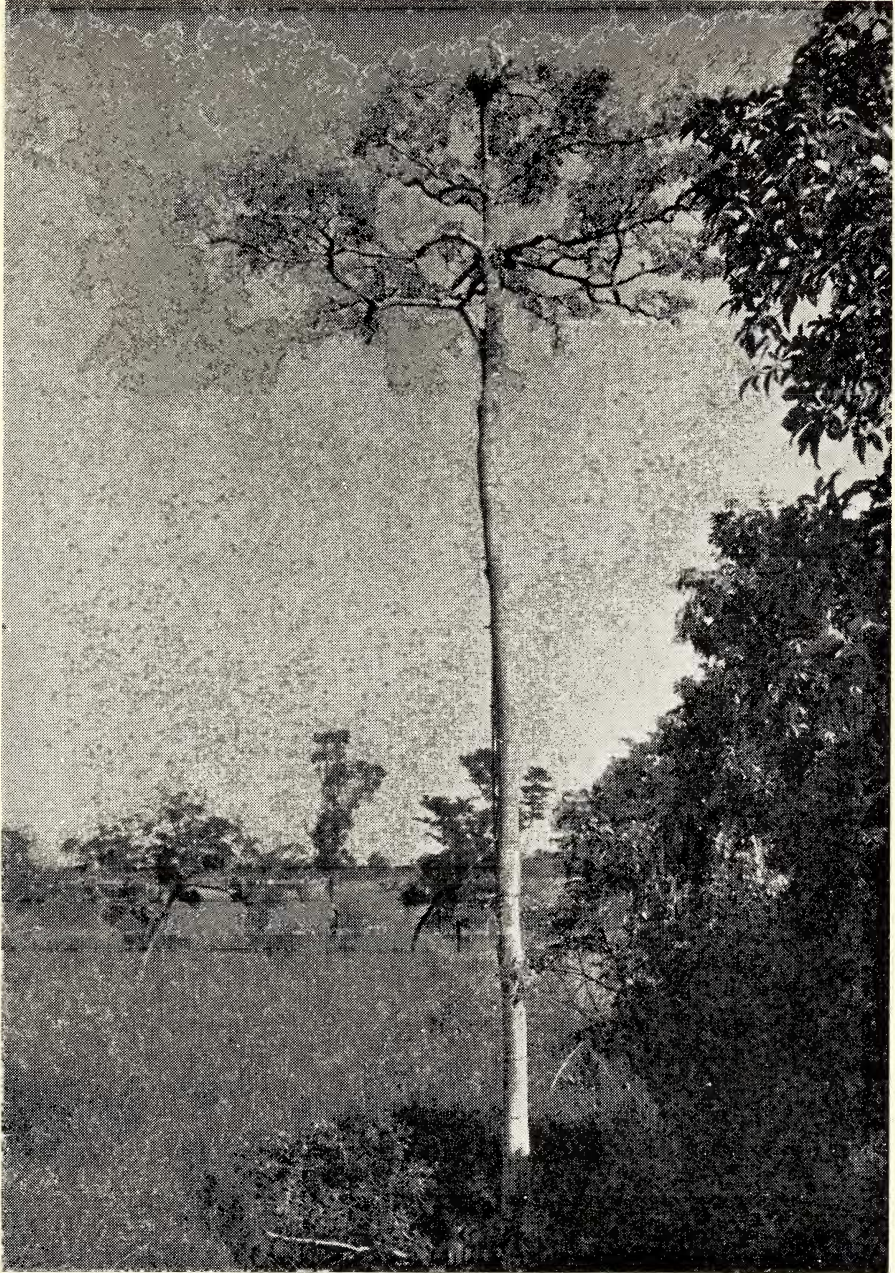
Non-breeding individuals or small flocks were seen at Bharatpur in August 1966 and near New Delhi in August 1967. However, the only nest (Plates III & IV) found was in the Kaziranga Wildlife Sanctuary, Assam, in November-December 1967. This is apparently the only record in this century of *L. dubius* breeding within the borders of India (Ali & Ripley 1968 : 107).

The Kaziranga nest was in the crown of a 'Satian' tree (*Aistronia scholaris*) about 27-30 m. high, growing in a small forest at the edge of an elephant-grass savannah (Plate III). The nest was in the highest tree within 500 m. When found on 27th November 1967, it contained two young approximately 30-35 days old, indicating that the eggs had been laid in late September.

Most behaviour patterns of the adults at the nest and of non-breeding wild birds, as well as of captives observed in the New Delhi and Calcutta Zoos, were closely similar to those of the Marabou Stork (*L. crumeniferus*) which was extensively studied in Africa (Kahl 1966a). However, the 'Up-Down' greeting display was an exception. In the Marabou's 'Up-Down', the bird throws its head vertically upward, utters a series of high-pitched squeals and lower-pitched, cow-like 'moos', and then points its bill *downward* and clatters loudly. The homologous display in *dubius* is similar in form and vocalizations, except that the clattering is done *upward*; as the head is lowered toward the normal position, all clattering ceases before the bill has reached the horizontal.



Kahl : Storks.



Nest-tree of *L. dubius* in Kaziranga Wildlife Sanctuary, Assam. The nest is at the top of the main trunk. (Rings around trunk are a ladder used by climbers to trim branches surrounding nest for an unobstructed view.)

(Photo : Author)